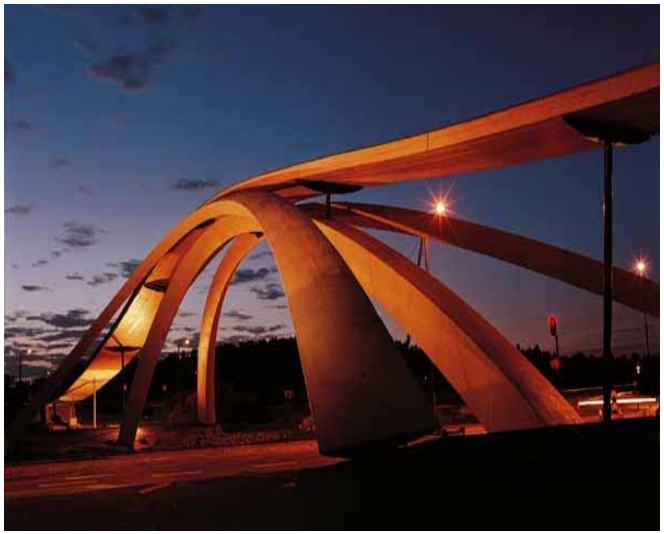
Advanced Planning and Scheduling



APS Overview

APRIL 2005

Note to Reader . . .

The purpose of this briefing is to provide an overview of Advanced Planning and Scheduling capabilities. Therefore, the briefing is text intense for education purposes. Note: Slide six provides additional information in the notes section.

Discussion Topics

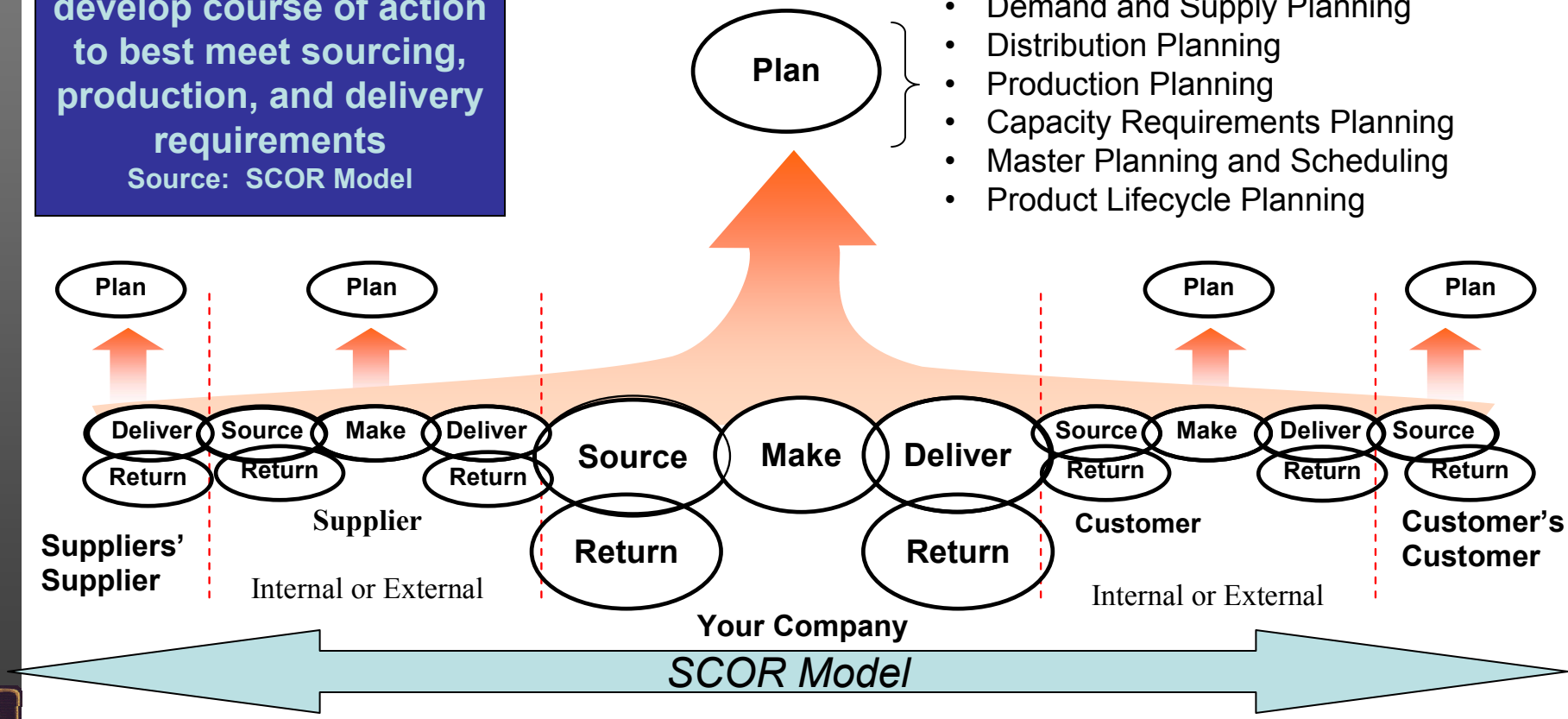
- Overview of PLAN
- Market Snapshot
  - Note: Market information based on distribution intensive supply chain
- Market Insights
- Lessons Learned
- Appendix
  - Select Vendor Profiles
  - Capgemini Adaptive Supply Chain Point of View*
  - Case Study

**AEIOO support contractor*

Overview of PLAN

PLAN processes balance aggregate demand and supply to develop course of action to best meet sourcing, production, and delivery requirements
Source: SCOR Model

Sub-Stages of PLAN
- Sales and Operating Planning
- Demand and Supply Planning
- Distribution Planning
- Production Planning
- Capacity Requirements Planning
- Master Planning and Scheduling
- Product Lifecycle Planning



Source: Supply Chain Council

PLAN - Solution Framework

Advanced Planning & Scheduling (APS)

- Demand & Supply Planning
- Multi-Site Capacity/ Factory Planning & Scheduling
- Distribution Planning
- Capacity Requirements Planning

Supply Chain Event Management

- Inventory Visibility
- Event Monitoring & Response

APS is next generation planning solution.

CORE ERP

- Human Capital Mgmt.
- Finance
- Operations

Bolt-On ERP Capability

- **SRM** (Supplier Relationship Mgmt.)
- **SCM** (Supply Chain Mgmt.)
- **Business Intelligence**
- **PLM** (Product Lifecycle Mgmt.)
- **CRM** (Customer Relationship Mgmt.)
- **Others…**

Note: APS capability is now bundled into SCM Bolt-On

Key APS Functionality

Demand & Supply Planning	Process of synthesizing internal and external market information to estimate demand.
Multi-Site Capacity/ Factory Planning & Scheduling	Process of taking total demand, netting against your supply, applying constraints and determining detailed production schedules to provide: WHAT, WHERE, WHEN, and for HOW MUCH/HOW LONG
Distribution Planning	Process for anticipating and aggregating distribution of items from supply source to end user.
Capacity Requirements Planning	Process to determine distribution of resources (labor and machinery) required to complete production tasks for specific period.

APS solutions enable effective supply and demand planning in collaboration with manufacturing, distribution and fulfillment operations to optimally satisfy end-customer demand, while reducing overall supply chain costs.

Note: Detailed definitions are provided in Notes View.

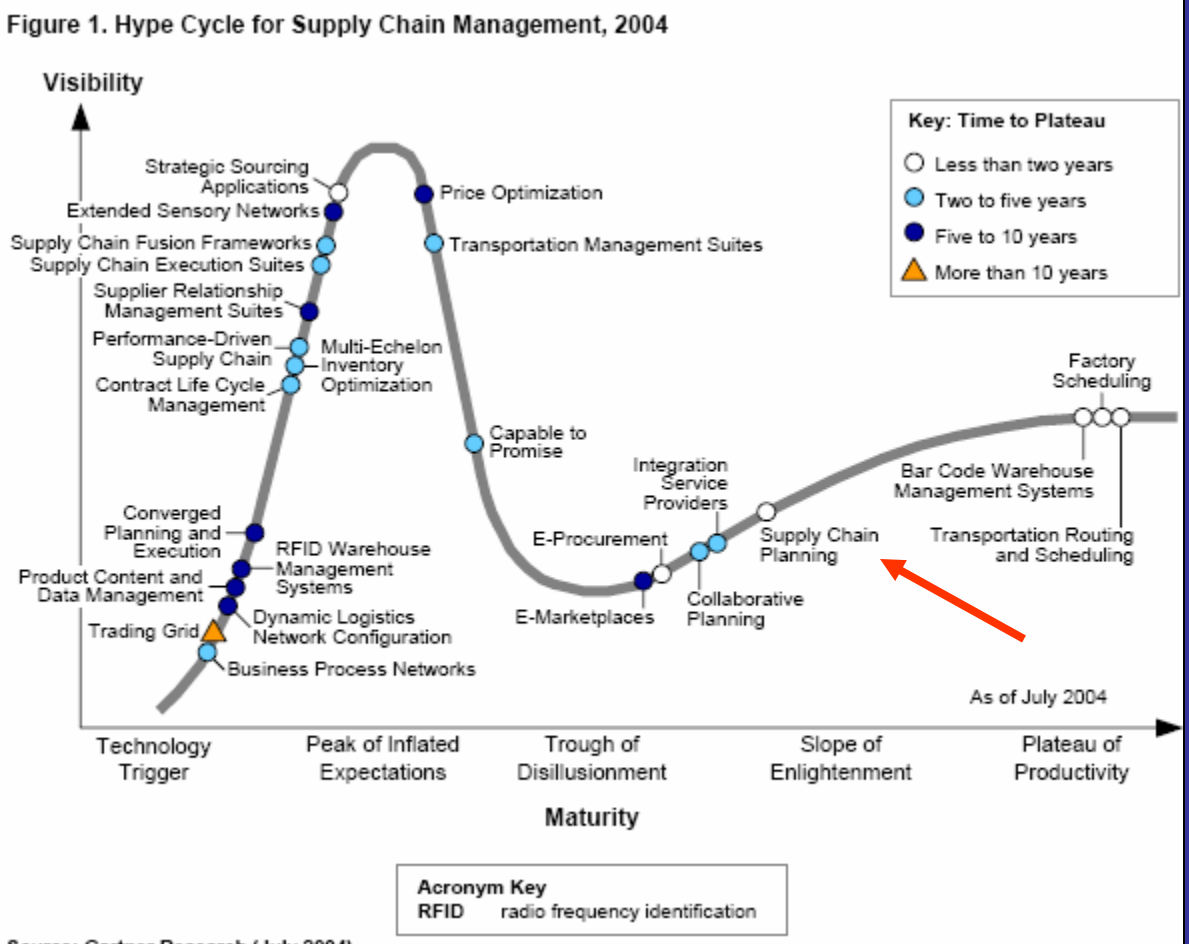
Some PLAN functionality is embedded in ERPs; sophisticated functionality is available in APSs

- APS provides superior planning logic to ERPs
  - APS not a substitute for ERPs (core ERP product suite)
  - Complementary tool – ERP enables transactions; APS is optimization tool
  - APS functionality delivered as bolt-on; regardless if offered by ERP provider
  - APS capabilities bundled in separate SCM modules
- APS is a decision support tool; requires closed loop integration with underlying SCM transaction systems (ERP or Legacy)
- APS is not a reporting tool

Key Differences in Planning Capabilities Between APS and ERP

Criteria	ERP	APS
Planning Material and Capacity	Sequential	Concurrent
Planning of time Buckets	Separate	Continual
Organizational Planning	Planning per function	Integrated Planning
Propagation of Changes	Uni-directional	Bi-directional
Allocate Supply to Customers	Unable	Able
Due Date Quoting (ATP)	Static	Dynamic
Type of Constraints considered	Only Soft Constraints	Hard and Soft Constraints
Manufacturing Lead Times	Fixed	Flexible
Simulation Capabilities	Low	High
Visibility of Planning	Local	Local and Global
Speed of Re-planning	Low	High
Assessing opportunity costs	Unable	Able

Supply Chain Planning is beyond the hype and is starting to deliver on promises, according to Gartner Group



Source: Gartner Research (July 2004)

Capgemini's View on Trends:

- **Demand-Shaping** – Stimulating demand in response to available supply to improve service levels and reduce costs
- **Dynamic Profitable-to-Promise Fulfillment** – Real-time product configuration, order promising and distribution optimization to maximize profitability
- **End-Customer Driven Demand Forecasting and Replenishment Planning** – Leveraging real-time demand signals and event monitoring to reduce inventory and improve fill rates, moving from traditional "push" model to more responsive "pull" model
- **Collaborative Planning and Execution** – Near real-time coordination of centralized planning with suppliers, distributors and logistics providers to insure optimal inventory and service

Benefits realized from Industry*

- **Quantitative**
  - Decreased inventory levels
    - Industry Benchmark: 30-50%
  - Increased inventory turns
    - Industry Benchmark: 40-50%
  - Increased order fill rate
    - Industry Benchmark: ~99%
    - Correlation between perfect order fulfillment (POF) and demand forecast ~1% improvement in forecasting yields 2% point improvement in POF
  - Increased sales due to product availability
    - Industry Benchmark: 0.25-1%
  - Reduced returns
    - Industry Benchmark: 5-20%
  - Reduced obsolescence
    - Industry Benchmark: 1-2%
  - Reduced distribution costs
    - Industry Benchmark: 10-15%
  - Increased asset utilization
    - Industry Benchmark: 10-20%

- **Qualitative**
  - Transform into professional "planning" organization
  - Improve "what-if" analysis capabilities
  - Enable exception-driven planning process
  - Focus on planning vs. expediting
  - Facilitate standardization of select supply chain processes

Key Takeaways:

- Demand forecast accuracy: one of four key metrics to assess health of organization's supply chain and a component to APS.
  - Greater accuracy can reduce cost across entire supply chain.
- Organizations good at forecasting average 15% less inventory, 17% stronger perfect order fulfillment, 35% shorter cash-to-cash cycle times, and one tenth of stock-outs as their peers.

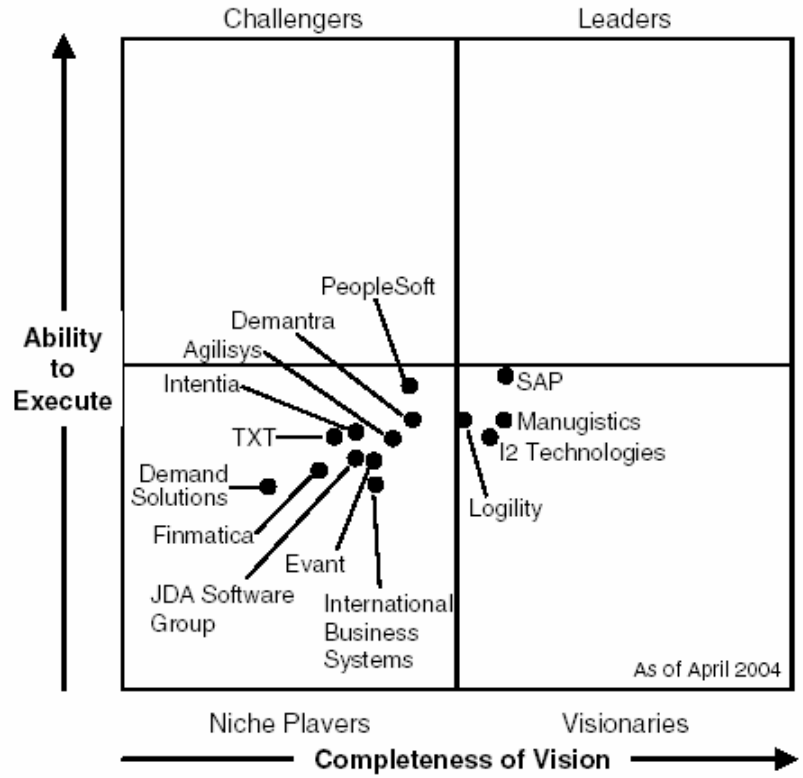
Benchmark Source: Capgemini Consulting, AMR Research, Gartner
(*Representative benefits for distribution-intensive supply chains)

Market Insights

NOTE: Snapshot point in time APRIL 2005. Landscape is dynamic and changes quickly.

According to Gartner:

Figure 1. Magic Quadrant for Distribution-Intensive SCP, 2004



Source: Gartner Research (April 2004)

According to Capgemini:

- For large, complex, distribution-intense supply chains, leading APS vendors (based on revenue, install base, and solution offerings) are: i2, Manugistics, and SAP.
  - Manugistics: Typically well-suited for consumer-products and retail-oriented supply chains
  - i2: Typically stronger in manufacturing arena where supply chains more complex and constrained
    - i2 also has strong transportation planning capabilities
  - SAP: Significant investments in R&D and solution development/refinement efforts
  - All three use constraint-based planning approaches.
- Oracle expanding its SCM functionality, targeting discrete manufacturers. Strength of industry-specific solution varies.

Lessons Learned

- Analysis of Alternatives
  - Total cost of ownership, integration costs, and time-to-value should be considered when analyzing alternatives
- Implementation
  - APS is not another system or module – need to clearly define scope and determine which functionality within each subsystem/module meets requirements
  - Phased implementation
    - Establish solid foundation before adding additional functionality or NSNs
    - Start simple and move to more complex
  - Pilot
    - Pilot process before tool implemented
    - Consider sandbox development and then integration

Lessons Learned - Continued

- Value Proposition
  - Achieving value proposition highly dependent on data accuracy. If data inaccurate, then APS another replanning exercise rather than strategically enabling forecasting and replenishment capabilities
- Data
  - Master data drives APS implementation
  - Quality master data and business warehouse are requirements to reap benefits of APS solution and obtain clean reports based on authoritative data
- Business Process
  - Understand key business drivers (i.e., improve forecast accuracy, customer service levels, fill rates, cycle time reduction)
  - APS project are heavily business process oriented enabled by technology
  - Develop and implement performance management program to track and manage business process improvements
    - Scorecard should be used by senior leadership to manage and create accountability

Lessons Learned

- Change Management
  - Continues to be major implementation issue
    - User acceptance
    - Consistent usage of tool
  - Provide early training for key users - improves understanding of engines and accelerates solution definition process
  - Offer certification classes to ensure inventory planners are skilled on all aspects of APS and relationship to supply chain goals
  - Communicate often and throughout entire project - critical
- Inventory Management
  - Number of NSNs, number of locations and frequency of order impact live cache and performance requirements

What does this mean to the Army?

- Greater visibility over materiel
- Inventory – right level, right place at the right time
- Effective supply chain efficiently managed
- Uncertainty can be managed
- Greater knowledge foxhole to factory and return
- Time definite delivery (TDD) achievable to support Warfighter needs

Key Takeaway:

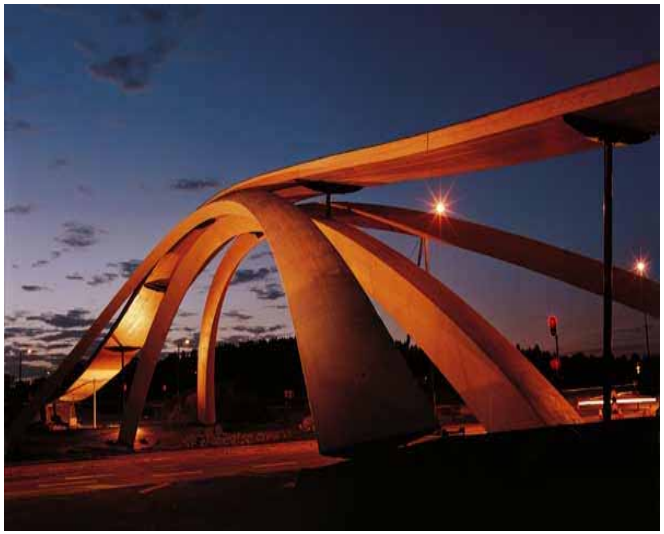
Greater service and support to Warfighter

- **Time Definite Delivery (TDD)**
- **Common Operating Picture**
- **Optimal inventory levels**

Key Considerations for the Army

- Which implementation approach “right” for the Army?
  - ERP-based bolt-on or 3rd party bolt-on
- Which capabilities critical for Army of campaign-quality with joint and expeditionary capabilities?
- How does APS fit into overarching logistics strategy?
- How can Army optimize existing SAP APO implementations such as LMP and eNova?
- What is authoritative source of data for forecasting?
- What is Army’s risk mitigation strategy for managing solution scalability?
- How does intelligent RFID challenge need for APS solution?
- Who is process owner for APS requirements?
  - Process modeling of requirements critical in implementing solution to support Warfighter

Appendix



- Select Vendor Profiles – Focus: APS
- Capgemini's Adaptive Supply Chain Point of View
- Capgemini Case Study

Profile on SAP APO

Profile:

SAP has a fully developed ERP suite with advanced functionality in advanced planning and scheduling, model-mix planning, and detailed production planning and scheduling. SAP's Advanced Planning and Optimization (APO) capability is available as part of the mySAP SCM module.

The application modules that make up APO uses constraint-based planning and optimization functions to plan for demand, supply, and production functions for the extended supply chain and also to support plant scheduling and sequencing, and global available-to-promise functions. APO has been designed as a stand-alone module and does not require SAP R/3 to be the backbone.

Solution Capabilities:

- Demand Planning
- Supply Network Planning
- Production Planning and Detailed Scheduling
- Inventory Collaboration Hub
- Global Available-To-Promise
- Transportation Planning and Vehicle Scheduling
- Event Manager

Strengths:

- Market leader based on PLAN and SCM revenue
- Pre-integrated APS application with mySAP SCM
- Supports collaboration at strategic, tactical, & operational planning levels
- Constraint-based planning and optimization
- Industry-specific functionality

Considerations:

- Dependent on R/3 master data
- APO is technically different than R/3 – complex to manage *live*Cache
- Implementation duration and effort should be considered as a key contributor to total project cost

Profile on Manugistics

Profile:

Manugistics solution is recognized for its strength in integrated demand planning, supply chain planning and forecasting applications, especially for distribution-intensive consumer products and retail oriented supply chains. Good integration capabilities, supports open standards such as XML and includes API's to back-end ERP, financial, and supply chain execution systems.
Manugistics has rearchitected its entire product line to leverage and extend the company's optimization software with intra and inter supply chain partners regardless of software platform.

Solution Capabilities:

- Demand Planning
- Master Planning
- Demand & Supply Balancing
- Collaborative Planning
- Services & Parts Planning
- Transportation Planning
- Production Planning & Scheduling

Strengths:

- Strong integration capabilities with ERP, legacy applications, product catalogs and data warehouses
- Proven SAP integration
- Focused R&D efforts
  - •New functionality includes: consensus forecasting – allows combination of multiple forecasts

Considerations:

- Strong contender for distribution-intensive supply chains with large number of planning items and location combination
- Has a focused Government Solutions unit with solutions being used by the U.S. Navy, U.S. Air Force, and the DLA.

Profile on i2

Profile:

i2's Advanced Planning and Scheduling solution, Supply and Demand provides a comprehensive closed-loop approach towards supply chain management. Capabilities in: strategic and operational planning, demand management, collaboration, fulfillment planning and execution, service planning, design, procurement, sales and service, and content management. The SCM component supports converged planning and fulfillment business processes by integrating forecasting, planning, and execution capabilities.

Solution Components:

- Collaborative Planning
- Demand Management
- Factory Planning
- Inventory Optimization
- Sales & Operations Planning
- Supply Chain Visibility
- Supply Management

Strengths:

- End-to-end integrated SCM capabilities
- PLAN is a core competency
- Renewed focus on complex, distribution intensive supply chains requiring multi-echelon inventory optimization and allocation decision-making
- Proven SAP integration via multiple implementations

Considerations:

- Financial stability and viability
- Changing management structure and potential impact to customers, development, support etc.
- Potential flexibility to allow for custom solution development or solution extension

Profile on Oracle

Profile:

According to AMR Research, Oracle has developed a holistic approach to planning that facilitates collaborative planning through a single architecture. Approach offers a means of migrating to internet-based collaboration. Solution set geared towards a manufacturing enterprise. Focus on advanced planning vice optimization. Integrated supply chain intelligence allowing planners to use near real-time data to improve end-to-end supply chain velocity

Solution Components:

- Advanced Supply Chain Planning
- Supply Chain Intelligence
- Global Order Promising
- Collaborative Planning
- Demand Planning
- Inventory Optimization
- Manufacturing Scheduling
- Supply Chain Event Mgmt.

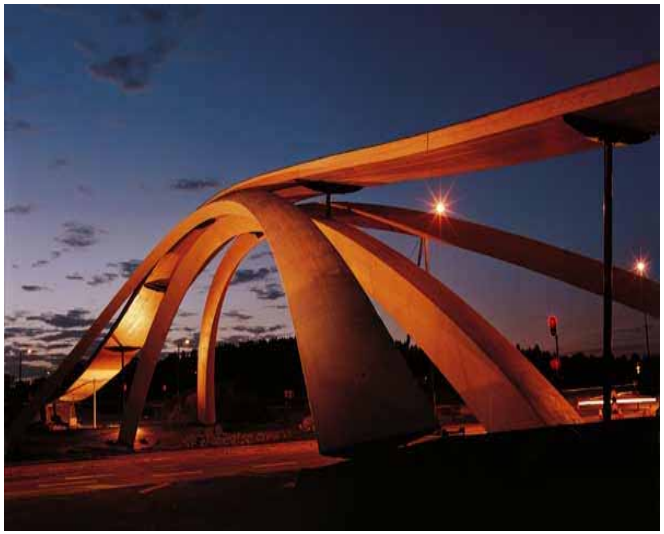
Strengths:

- Financial viability
- Extends traditional MRP capabilities
- Integrated planning apps. and transactional systems into single architecture
- Out-of-the-box optimizations, extensive defaulting rules for penalties and priorities and KPIs
- Multi-level cross-enterprise planning

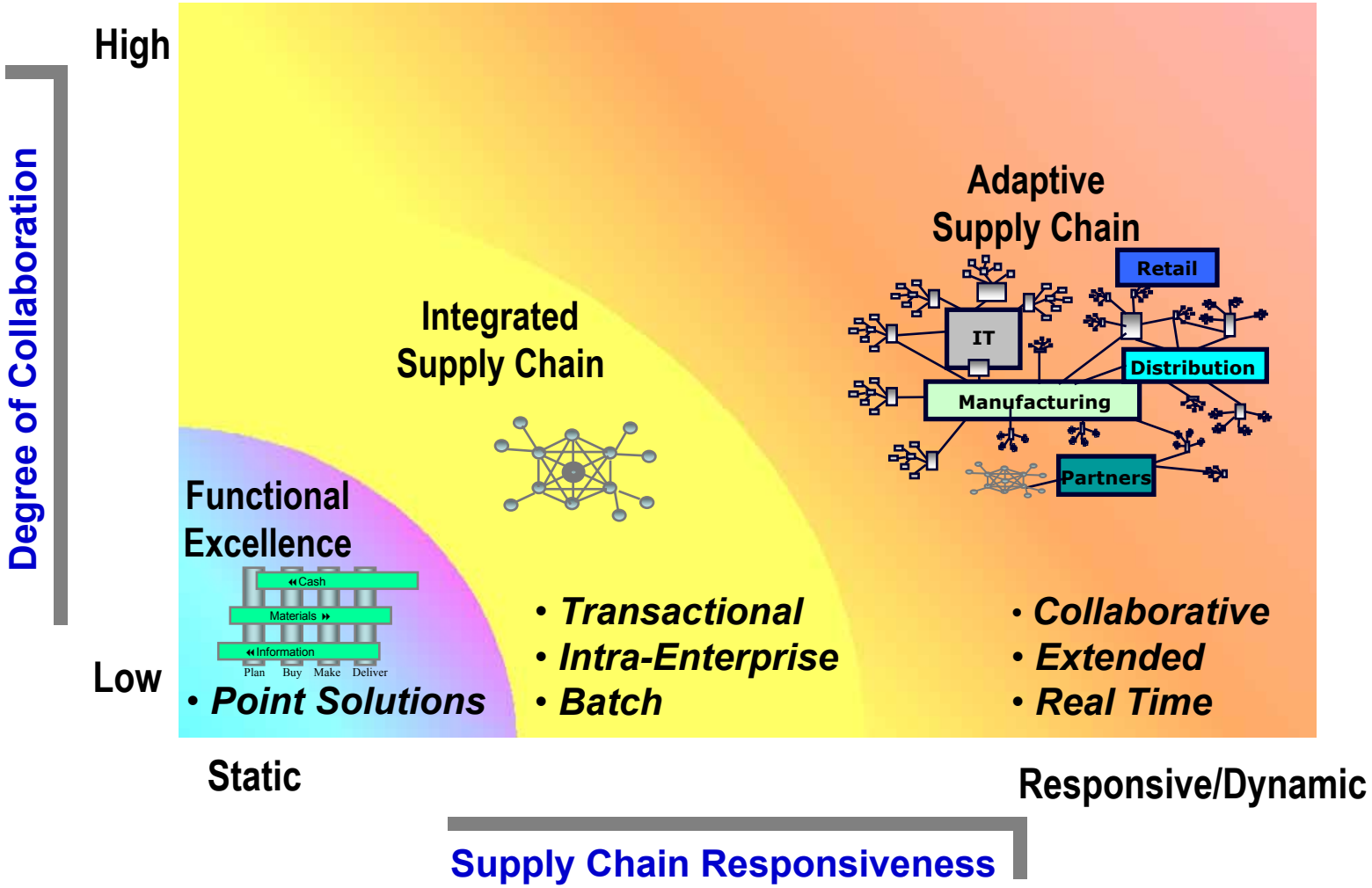
Considerations:

- Transportation planning capabilities still under development
- Solution geared towards manufacturing intense enterprise

Capgemini's Adaptive Supply Chain Point of View



Market leaders realize next generation supply chain is adaptive

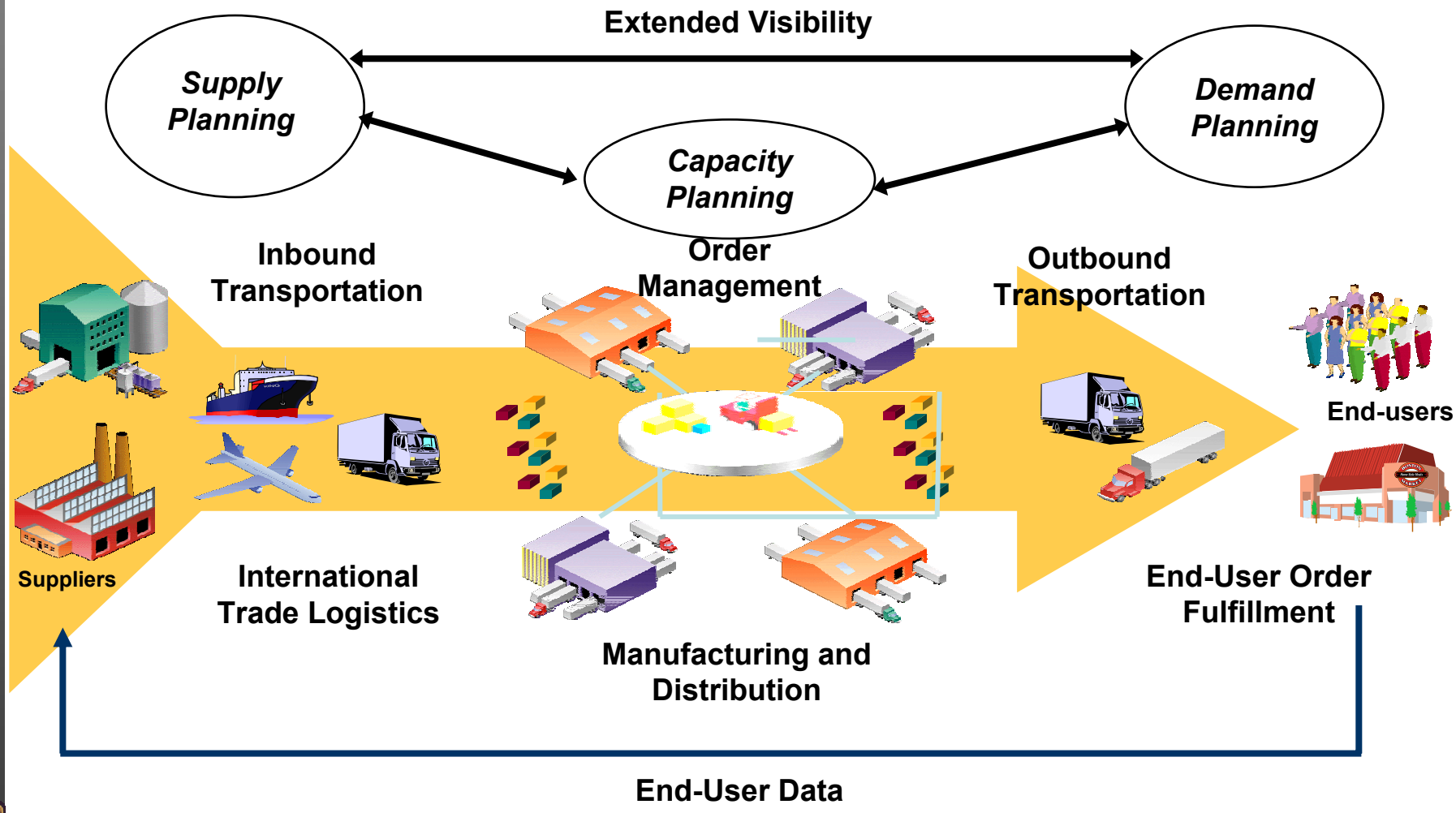


. . . demanding a shift in mindset and operating model

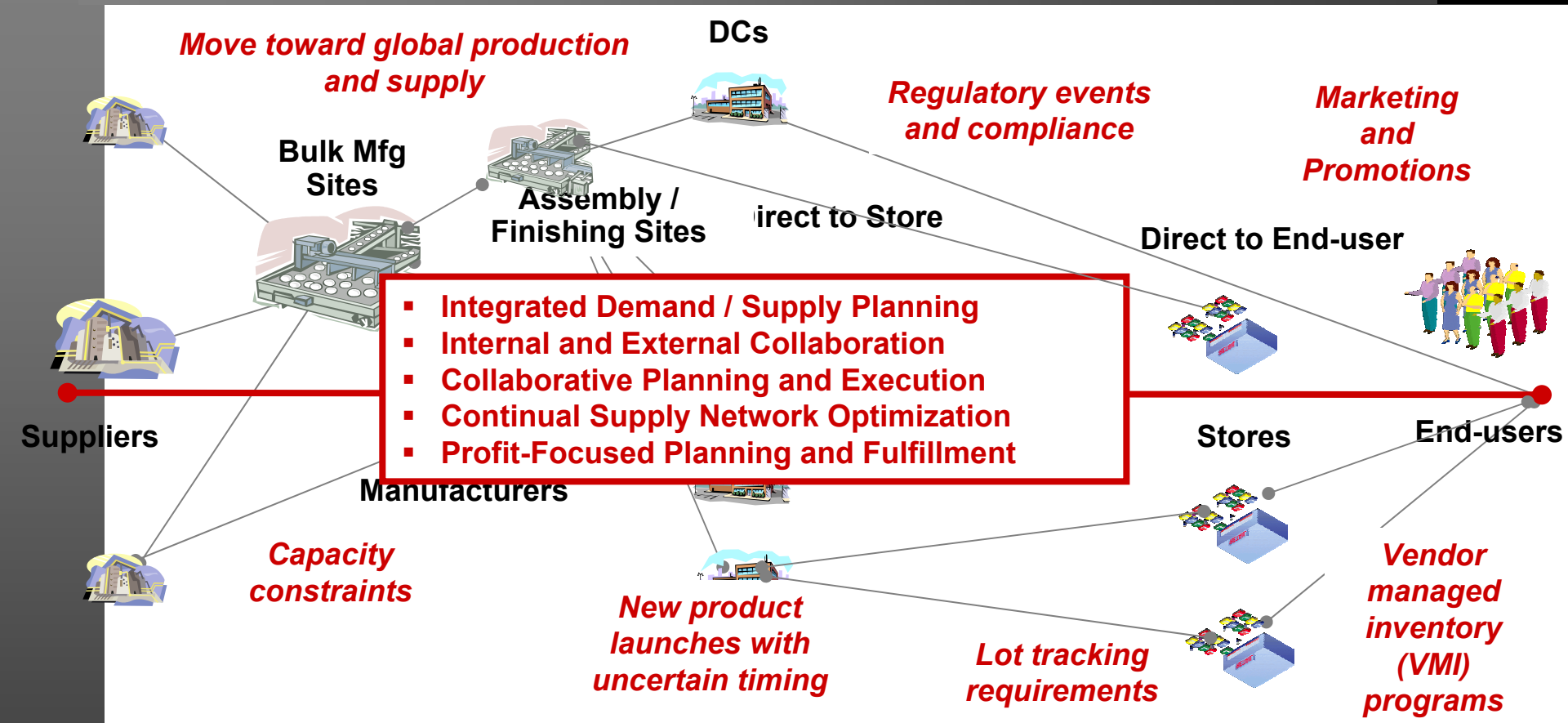
Business Dimension	Stage 1 Functional Excellence	Stage 2 Integrated Supply Chain	Stage 3 Adaptive Supply Chain
Integration	Silo	Enterprise	Extended Enterprise
Organization	Departmental	Centralized	Collaborative
Performance	Cost	Cost and Service	Revenue and Profit
Decision	Functional	Process	Event-Based
Technology	Point Solution	ERP/Bolt-on	Web Connected
Time Focus	Months to Weeks	Weeks to Days	Real Time
KPI Focus	Individual / Department	Company-wide	Cross-Enterprise

Streamline the Process → Build the Platform → Become Adaptive

Adaptive supply chains respond quickly & effectively to changes

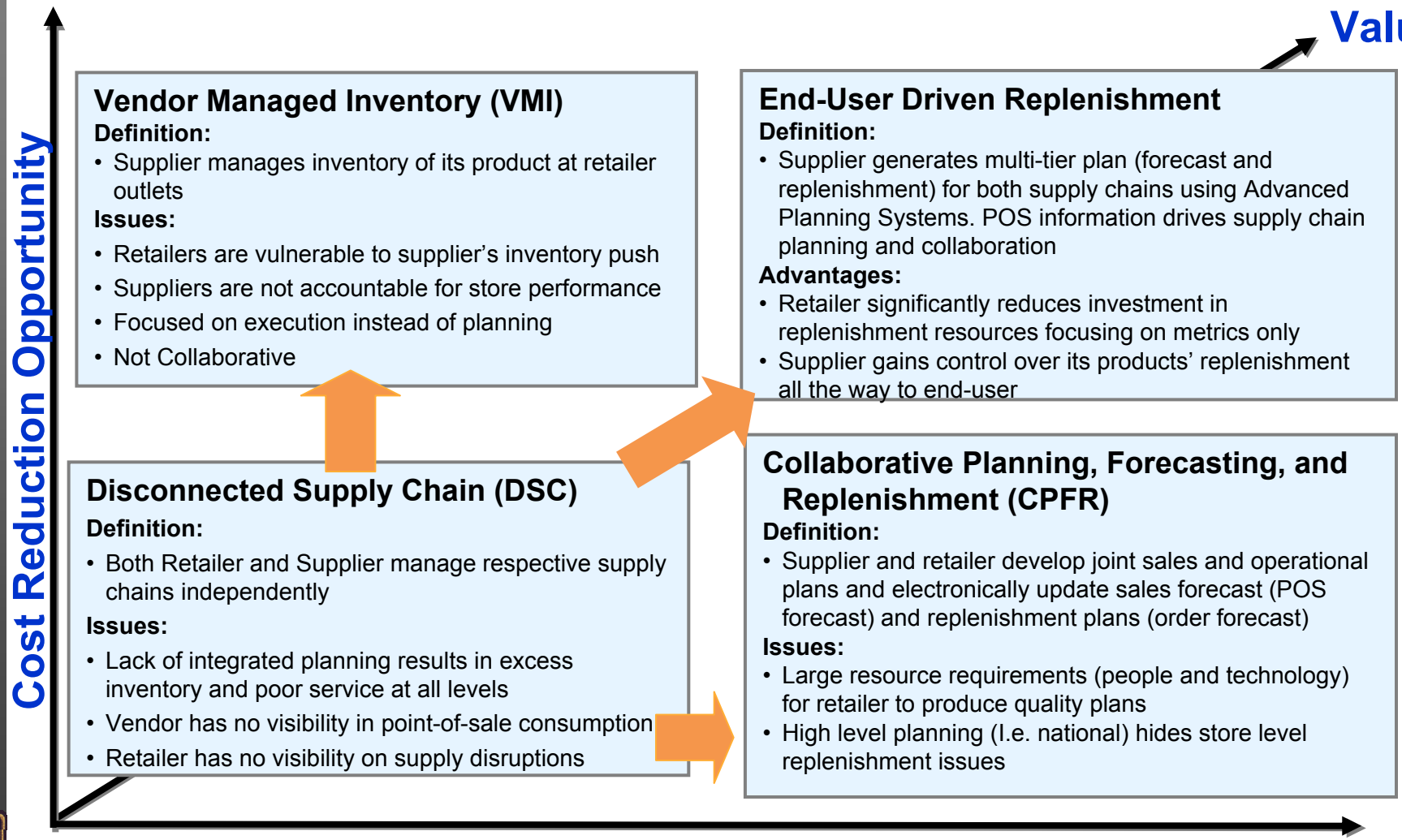


First step to enabling adaptive supply chains is to transform planning and operations



Successful transformation of planning and operations solutions can generate millions in value and create a competitive advantage

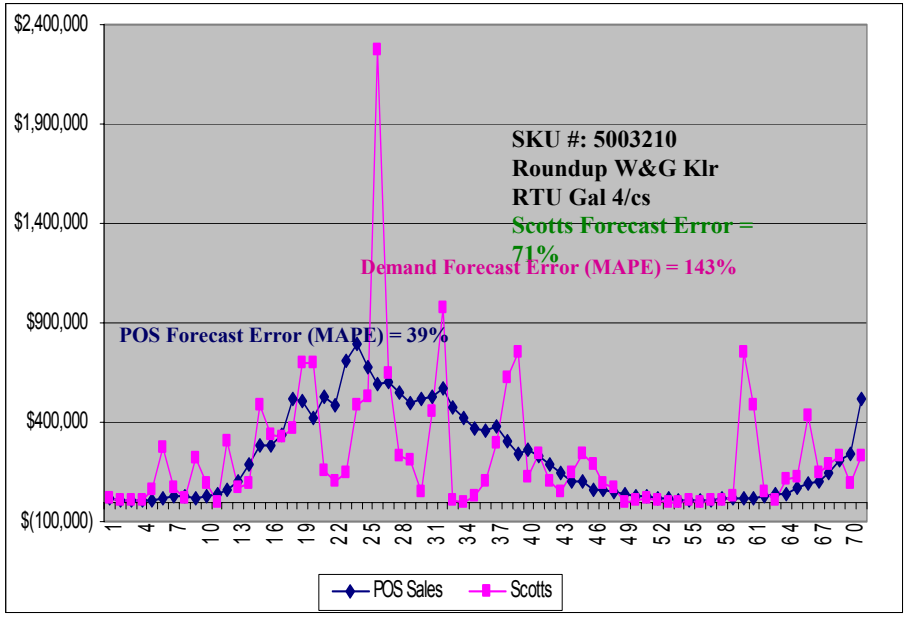
End-customer driven replenishment is the next frontier



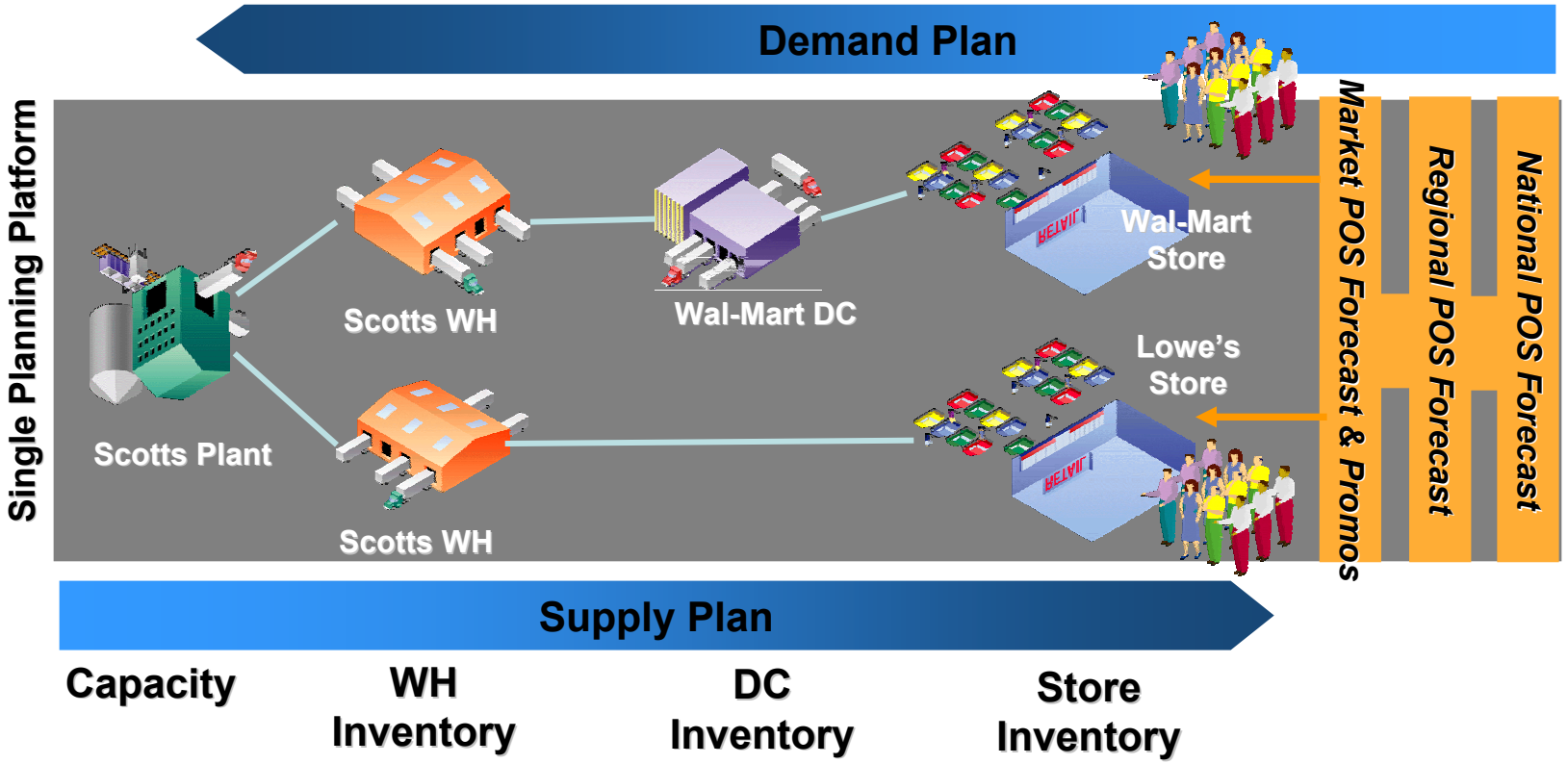
Case Study – Scotts Company

Success Story

- Leading manufacturer and marketer of consumer branded products for lawn and garden care; 80% of revenues from 3 large retailers (Wal-Mart, Home Depot and Lowes). Seasonal business – peak demand concentrated in summer months.
- Attempts to produce a good forecast using shipments history failed due to large "bullwhip" effect created by constantly changing buying and inventory policies as well as lack of visibility into actual customer demand signals.
- Lack of forward visibility to store level replenishment meant Scotts had to react to retailer orders instead of being creating a time-phased replenishment plan
- Inventory turns stuck between 2 and 3, fill rates below 90%, forecast error above 50% at national level and in-stock service at stores below 90%.

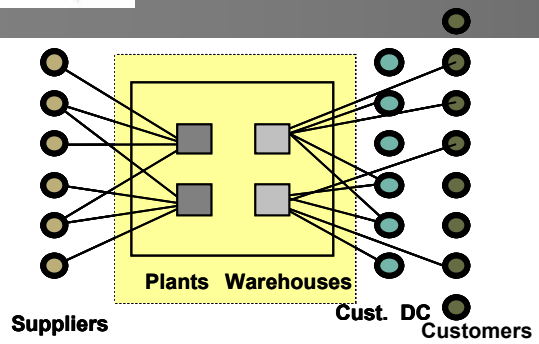


Solution Approach



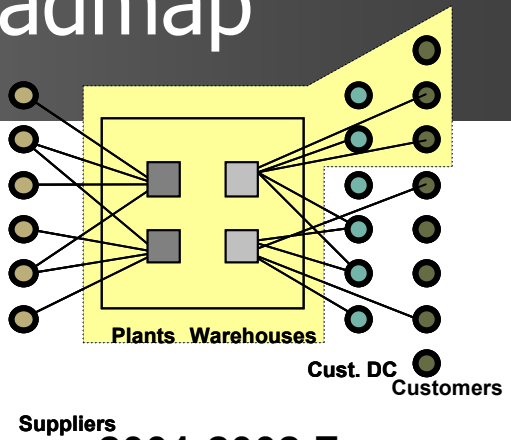
- Constrained, multi-tier planning with backward and forward propagation of requirements from retailer stores to Scotts manufacturing plants
- Inventory optimized at every level of extended supply chain. Time-phased safety stock protects against demand/supply variability
- POS forecasting at National, Regional, and Market Level
- Advanced demand management capabilities for life cycle, seasonal and slow moving items, and causal factors
- Flexible demand hierarchies and exception management for collaboration and promotional activities at any level

Transformation Roadmap



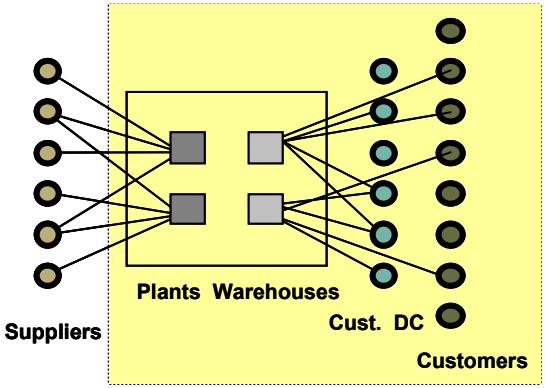
2000-2001 Focus

- "Four Walls" Planning
- Judgmental Forecast in Galt (sales)
- Distribution Requirements in SAP R/3



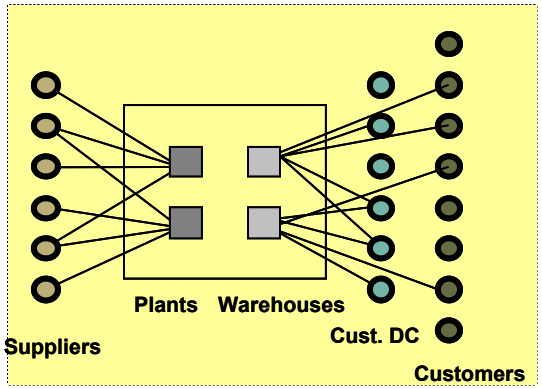
2001-2002 Focus

- Lowe's CBR pilot (Manugistics)
- Supply Chain team at Lowe's BDT
- Distribution Requirements in SAP R/3



2002-2003 Focus

- Added Wal-Mart/Sam's and Home Depot to CDR Solution
- Supply Chain teams at all BDTs
- Distribution Requirements in Manugistics



2004+ Focus

- Add more customers to CDR (Kmart, Costco, Target, etc…)
- CDR global rollout and new initiatives
- Supplier integration

Value Delivered

Scotts Supply Chain Before CDR	Scotts Supply Chain After CDR
• Inventory turns in low 2s • Fill Rates at 90% • Order Forecast Accuracy Below 50% at National Level • In-stock Service at 90%	• Inventory turns closing 5.5 target • Fill rates at 98% • Order Forecast Accuracy More than 80% at Regional Level • In-stock Service at 95%

WAL★MART

Vendor of the Year 2003

THE HOME DEPOT

Vendor of the Year 2003